

RESULTS FROM 1999-2000 USDA IR-4 MBA FIELD TRIALS IN CA AND FL STRAWBERRIES

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The field trials reported herein are part of a project of the USDA's IR-4 Program which began in 1998, to identify alternatives to methyl bromide for preplant soil fumigation in strawberries. During the 1999-2000 strawberry growing season, four trials were conducted, two in California (Oxnard, Ventura Co., and Salinas, Monterey Co.) and two in Florida (both in Dover, Hillsborough Co.). This report summarizes the materials/methods and results from these field experiments.

A list of the treatments evaluated at each of the field trial sites is provided in Table 1 (CA) and Table 2 (FL). Product names, target rates and application methods are outlined for each material tested. Several of the treatments comprise two or more products, applied separately. These combination treatments were designed in an effort to control the broad spectrum of soilborne pests, pathogens and weed seeds that are currently controlled by the industry standard, methyl bromide/chloropicrin (mb/pic). Each treatment was replicated four times in a randomized complete block design. The replicate plot size in California was a single bed (64 inch centers in the Oxnard test, 46 inch centers in the Salinas test), 150 ft. long; in Florida, the replicate plot size was a single bed (48 inch centers at both sites), 75 ft long. Strawberry varieties utilized in these tests were Camarosa (Oxnard and Dover-2), Diamante (Salinas) and Sweet Charlie (Dover-1).

Over the course of each field trial, treatments were evaluated for their effects on the following variables: (1) control of soilborne phytopathogenic fungi (*R. Solani* and *V. dahliae* in CA, *P. ultimum* in FL), (2) control of plant parasitic nematodes (utilizing *T. semipenetrans*, citrus nematode, as an indicator species in CA, and the indigenous *B. longicaudatus*, sting nematode, in FL), (3) control of weeds (utilizing both seeded and natural populations of various weed species), (4) strawberry plant growth and vigor (using vigor ratings and plant diameter measurements), and (5) strawberry marketable and cull fruit yields. Results from the marketable fruit yield evaluations will be highlighted in this presentation.

The season total marketable fruit yields (data through end of August 2000 for the Salinas, CA trial) from the two CA trials and the two FL trials are reported in Tables 1 and 2, respectively, along with results from the statistical analyses of these data (ANOVA, DMRT @ $P \leq 0.05$). Yield data from trials within CA and FL were averaged separately by replicate and are also reported in these tables. In the CA trials, treatments which produced a mean yield (average from two trials) statistically comparable to

mb/pic (67/33) were: iodomethane/chloropicrin (67/33 at 350 lbs. and 50/50 at 235 lbs. per acre), Enzone + chloropicrin (EC) + metam sodium (at rates of 48.2 ozs. per 100 gals. irrigation water - preplant, 200 lbs. per treated acre and 37.5 gals. in 1000 gals. water carrier per treated acre, respectively), the two InLine combination treatments (applied at 38.4 gals. per treated acre and combined with either metam sodium at 37.5 gals. in 1000 gals. water carrier as a broadcast bed-top spray or with Basamid, applied at 200 lbs. per treated acre also over the bed-top and incorporated with water), and a combination treatment of DiTera + chloropicrin (EC) + metam sodium (at rates of 8 gals, 200 lbs. and 37.5 gals. per treated acre, respectively). In the Enzone and DiTera combination treatments, the approach here was to combine the nematicidal properties of these products with the fungicidal activity of chloropicrin, and the general biocidal activity of metam sodium as a soil surface broadcast spray over the bed-top strictly for weed control (applied just prior to application of the plastic bed mulch). With the InLine combination treatments, either metam sodium or Basamid was used to target weed seeds in the bed-top. All treatments resulted in a significant yield increase, relative to the Untreated Control, with exception of the metam sodium broadcast spray "check" treatment. This metam broadcast spray "check" treatment was included to assess whether this application method / rate (designed for bed-top weed control) would result in any additive effects on marketable yield and other variables in the combination treatments which included metam for weed control.

Similar results were obtained from the two FL trials, with the following treatments producing a mean marketable fruit yield (averaged from two trials) statistically comparable to the mb/pic standard: both treatments of iodomethane/chloropicrin (67/33 and 50/50 at 350 and 235 lbs. per treated acre, respectively), and the two Telone C35 combination treatments (C35 shank applied at 35 gals. per treated acre and combined with either metam sodium or Basamid, applied to the bed-top). All treatments resulted in a significant yield increase, relative to the Untreated Control, with exception of the metam sodium broadcast spray "check" treatment.

Table 1. Treatment descriptions (products, rates and application methods) and mean marketable fruit yields from 1999-2000 IR-4 MBA California strawberry field trials.

TRT No.	PRODUCT(S)	RATE ¹	APPLICATION METHOD	MARKETABLE YIELD OXNARD	MARKETABLE YIELD SALINAS	MEAN ⁶ MKT. YIELD
1A	Iodomethane(1x)/Chloropicrin(67/33)	350 lbs	Bed/Shank ²	3393.4 de	5685 ab	4539.0 b
1B	Iodomethane(1/2x)/Chloropicrin(50/50)	235 lbs	Bed/Shank ²	3191.0 ef	5946 a	4568.3 ab
1C	Iodomethane(1/2x)	116 lbs	Bed/Shank ²	3050.1 fg	5141 cd	4095.3 c
2A	Metam Sodium + Chloropicrin EC + Enzone(1x)	37.5 gals 200 lbs 48.2 ozs and 16.1ozs/100gal (pre- and postplant)	Broadcast spray over bed top ³ Drip ⁴ Drip ⁴	3990.5 ab	4838 de	4414.1 b
2B	Same as 2A, except Enzone applied at 2x rate			3506.1 cd	4567 ef	4036.5 cd
3	Basamid + InLine (Telone C35 EC)	200 lbs 38.4 gals	Broadcast over bed top ⁵ Drip ⁴	4271.4 a	5414 bc	4842.5 a
4	Metam Sodium	75 gals	Drip ⁴	2779.4 gh	4248 fg	3513.4 ef
5	Metam Sodium + InLine (Telone C35 EC)	37.5 gals 38.4 gals	Broadcast spray over bed top ³ Drip ⁴	4160.5 a	5239 bcd	4699.6 ab
6	Methyl Bromide/Chloropicrin (67/33)	350 lbs	Bed/Shank ²	3507.1 cd	5580 abc	4543.3 b
7	Metam Sodium(Check)	37.5 gals	Broadcast spray over bed top ³	2627.3 h	3835 gh	3231.0 fg
8	Metam Sodium + Chloropicrin EC + DiTera ES	37.5 gals 200 lbs 8 gals (pre-plant) / 5 gals (post-plant)	Broadcast spray over bed top ³ Drip ⁴ Drip ⁷	3796.0 bc	----	3796.0 de
9	Untreated Control	---	----	2494.0 h	3568 h	3030.8 g

¹ Rates are given in quantities of product per treated acre, except for Trt. #'s 1A,1B, 1C and 6. Treated acre rates for these treatments are 500, 336, 166 and 500 lbs., respectively, for the Oxnard test, and 614, 412, 204 and 614 lbs., respectively, for the Salinas test.

² Shank-applied treatments were shanked-in using two shanks per bed in Oxnard, one shank per bed in Salinas, with shanks at 8 - 10 inches deep.

³ Metam Sodium broadcast-spray treatments for bed-top weed control were applied using 1000 gallons of water per treated acre. Beds were immediately tarped following application.

⁴ Drip-applied Chloropicrin EC, Enzone and InLine treatments applied using 1.5 inches of irrigation water. Drip-applied metam sodium applied using 2 inches of irrigation water. All drip treatments applied using 2 lines per bed, except Trt. #4 (3 lines per bed in Oxnard). For Trt. #'s 2A and 2B, 3 and 1 postplant applications of Enzone were made at the Oxnard and Salinas sites, respectively.

⁵ Basamid granular formulation broadcast-applied to bed top; incorporated into soil using 0.75 inch of broadcast-applied water.

⁶ Marketable fruit yield means are averages from two trial sites (Oxnard and Salinas); means within a column followed by the same letter are not significantly different (p≤0.05).

⁷ DiTera ES drip-applied using 1.5 inches irrigation for the preplant application and 1.0 inch of water for the postplant application.

Table 2. Treatment descriptions (products, rates and application methods) and mean marketable fruit yields from 1999-2000 IR-4 MBA Florida strawberry field trials.

TRT No.	PRODUCT(S)	RATE ¹	APPLICATION METHOD	MARKETABLE YIELD DOVER-1	MARKETABLE YIELD DOVER-2	MEAN ⁶ MKT. YIELD
1A	Iodomethane(1x)/Chloropicrin(67/33)	350 lbs	Bed/Shank ²	2072.4 cd	1618.7 a	1845.6 a
1B	Iodomethane(1/2x)/Chloropicrin(50/50)	235 lbs	Bed/Shank ²	1909.3 de	1747.3 a	1828.3 a
2A	Metam Sodium + Chloropicrin EC + Enzone (1x)	37.5 gals 200 lbs 48.2 ozs and 16.1ozs/100gal (pre- and postplant)	Broadcast spray over bed top ³ Drip ⁴ Drip ⁴	1875.2 de	1107.9 b	1491.5 b
2B	Same as 2A, except Enzone applied at 2x rate			1756.0 e	686.9 c	1221.4 c
3	Basamid + Telone C35	200 lbs 35 gals	Broadcast over bed top ⁵ Bed/Shank ²	2674.0 a	1528.6 a	2051.8 a
4	Metam Sodium	75 gals	Drip ⁴	1730.2 e	457.7 c	1094.0 c
5	Metam Sodium + Telone C35	37.5 gals 35 gals	Broadcast spray over bed top ³ Bed/Shank ²	2340.6 b	1542.3 a	1941.5 a
6	Methyl Bromide/Chloropicrin (67/33)	350 lbs	Bed/Shank ²	2245.4 bc	1353.5 ab	1879.7 a
7	Metam Sodium(Check)	37.5 gals	Broadcast spray over bed top ³	463.3 f	13.0 d	238.1 d
9	Untreated Control	---	----	612.8 f	25.4 d	231.4 d

¹ Rates are given in quantities of product per treated acre.

² Shank-applied treatments were shanked-in using two shanks per bed, 12 inches apart and 12-14 inches deep.

³ Metam Sodium broadcast-spray treatments for bed-top weed control were applied using 750 gallons of water per treated acre. Beds were immediately tarped following application.

⁴ Drip-applied Chloropicrin EC and Enzone (preplant appl.) treatments applied using 1.5 inches of irrigation water. Two postplanting Enzone applications made using 1.0 inch of water. Drip-applied metam sodium applied using 2 inches of irrigation water. All drip treatments applied using 2 lines per bed, except Trt.# 4 which was applied using 3 lines per bed. For Trt.#'s 2A and 2B, two postplant applications were made.

⁵ Basamid granular formulation broadcast-applied to bed top; incorporated into soil using 0.75 inch of broadcast-applied water.

⁶ Marketable fruit yield means are average from two trial sites (Dover-1 and Dover-2); means within a column followed by the same letter are not significantly different (p>0.05).